Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/440
JAPAN
February 1964
Submitted in:
ENGLISH and FRENCH

Confidential until official release during Conference

Abstract

ISOTOPE SEPARATION BY CONCURRENT GAS CENTRIFUGE

A. Kanagawa, Y. Takashima, and Y. O yama*

* Research Laboratory of Nuclear Reactor, Tokyo Institute of Technology

The relations between the separative power, the separation factor, the gas flow rate, the length of cylindrical rotor, the cuts and the radii to be extracted have generally been analized concerning isotope separation by the concurrent type of gas centrifuge and compared with those in the case of the countercurrent type.

The more generalized differential equation than that used by Cohen, which can be applied to centrifugal separation through (n+1) cylindrical thin concurrent streams, has been obtained, and solved in the cases of n=1 and n=2.

First of all, in the case of n=1, which already solved by Cohen, the relations of gas feed rate per length of the rotor to both the separation factor and the separative power have been calculated and compared with those in the case of countercurrent flow using a parameter of Z/r_0 which is the ratio of the length of rotor to the radius. As a result, it has been cleared quantatively that, as Z/r_0 increases, remarkably more flow rate should be required in the concurrent flow to get the same value of separative power than that in the countercurrent flow, and the flow rate in the concurrent flow, however, is comparable with the circulation rate in the countercurrent flow.

In the case of n=2, the higher maximum separative power is possible to be realized even if the inner two thin streams are mixed at the exit, than that in the case of n=1. The optimum condition in this case is as follows; $r_1/r_0=0.45$, $r_2/r_0=0.6$, $\theta_1=0.19$ and $\theta_2=0.31$, where r_1 and r_2 are the radii of inner two streams and θ the cut. The maximum value of the separative power is 1.066 times of that in the case of n=1, then the optimum flow rate is 1.130 times.

As a result of these analyses, it will be suggested that the thickness of the flow path which should exist more or less in practice may bring rather preferable separation performance.